



Studies on rebound effects in China

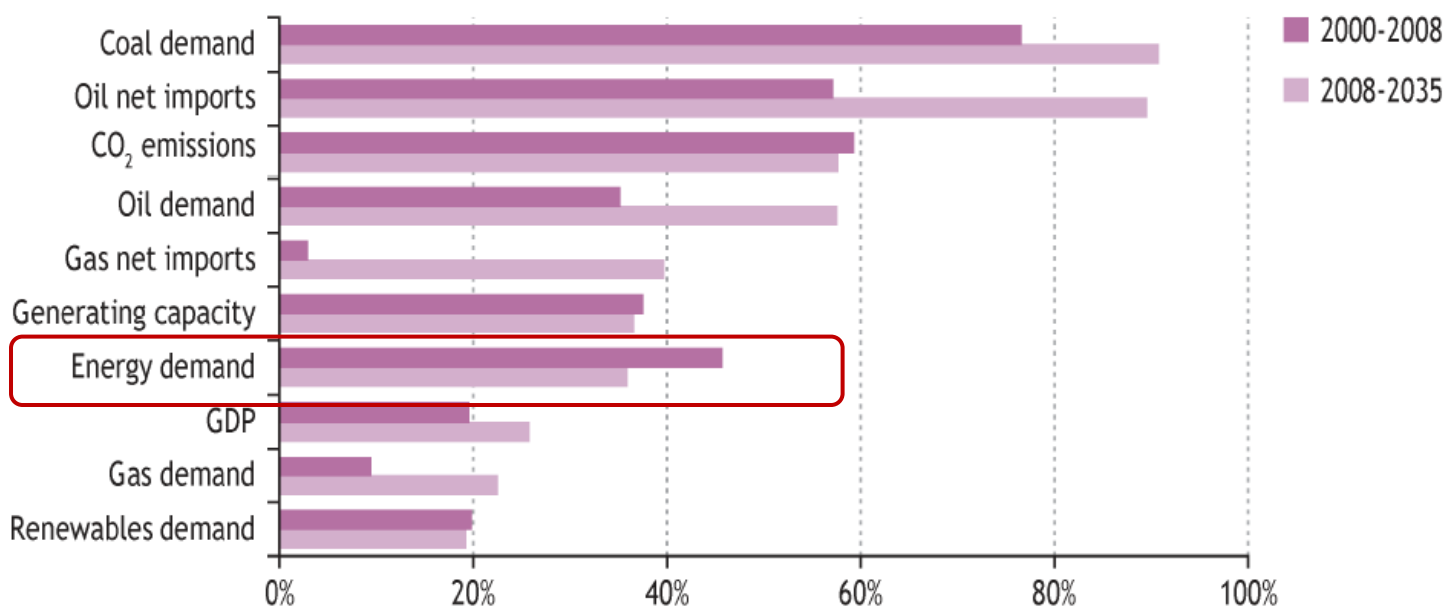
- ▶ Cheryl Chi
- ▶ Post-docotal researcher
- ▶ 27 June 2011

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China's energy system v.s. World system

China's share of the projected net global increase for selected indicators

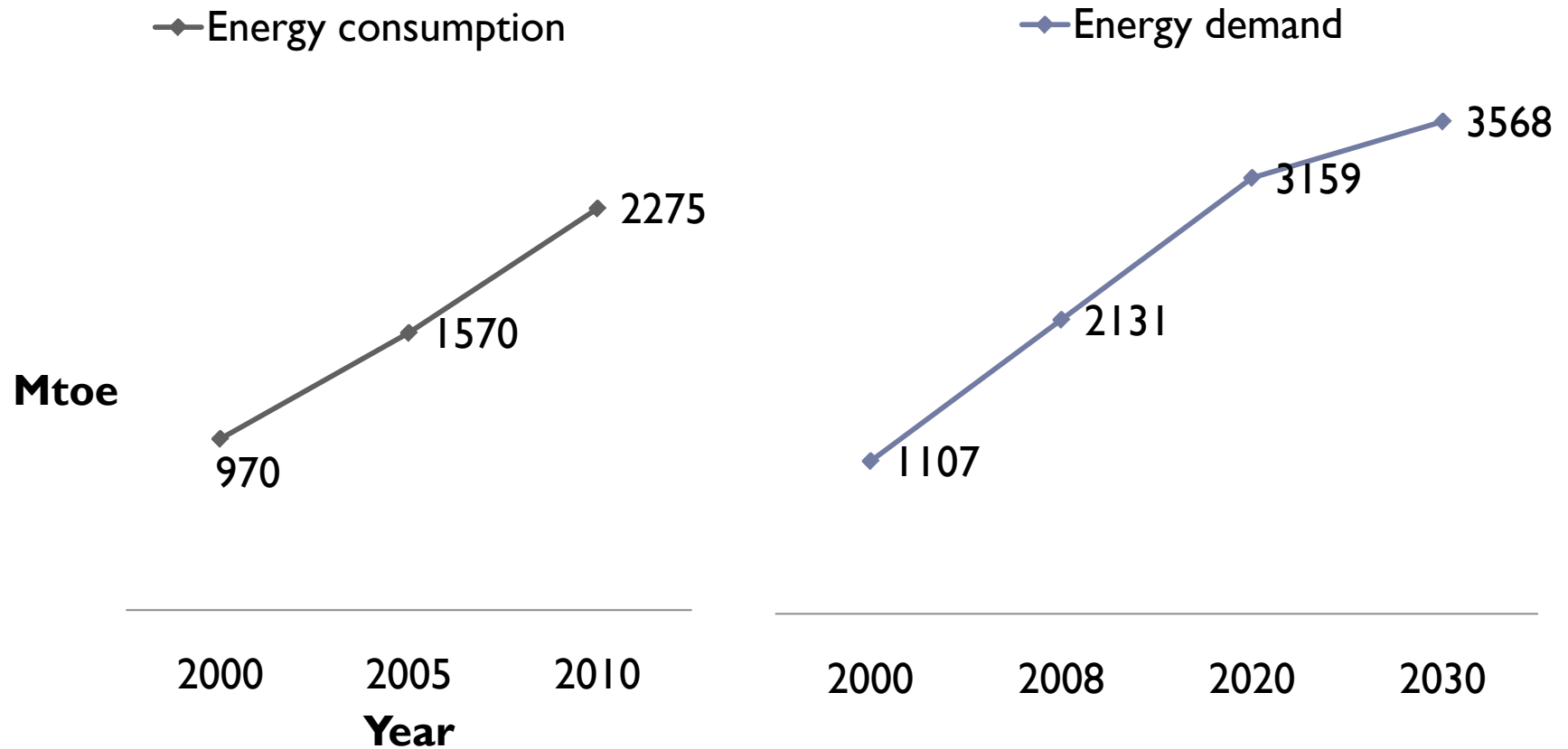


Source: IEA World Energy Outlook 2010



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China's energy demand



Source: IEA World Energy Outlook 2010



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12th Five Year Plan (2011-2015)

- ▶ Main theme: increasing disposable income & living standards
- ▶ Increasing consumption
 - ▶ increase household disposable income by an annual rate of 7 percent
 - ▶ raising minimum wages
 - ▶ personal income tax reform
 - ▶ improved rural land distribution
 - ▶ Increasing the rate of urbanization (47.5% → 51.5%)



12th Five Year Plan

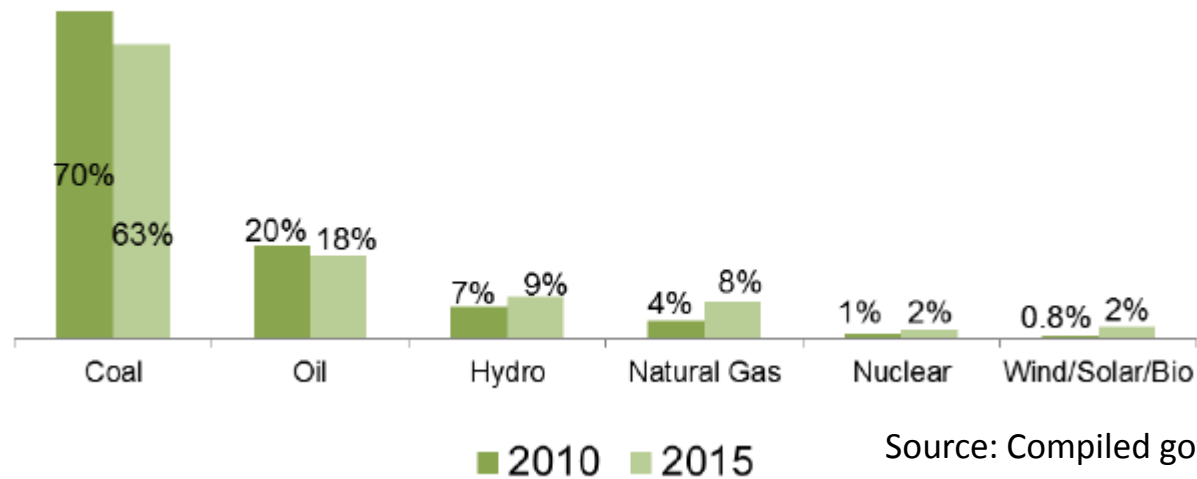
- ▶ **Promoting environmental protection and energy efficiency initiatives**
 - ▶ Further developing low-carbon industries, such as electric vehicles, wind turbines and solar panels
 - ▶ Control of total energy use: the equivalent of 4 billion tons of coal by 2015
- ▶ **Mandatory targets:**
 - ▶ Energy consumption per unit of GDP, reduction of pollution emissions, and forest coverage...



Policy targets

- ▶ increase non-fossil fuels energy consumption to 11.4 %
 - ▶ 11th five year plan: 8.3%

China's Estimated Energy Consumption



Source: Compiled government data, APCO analysis



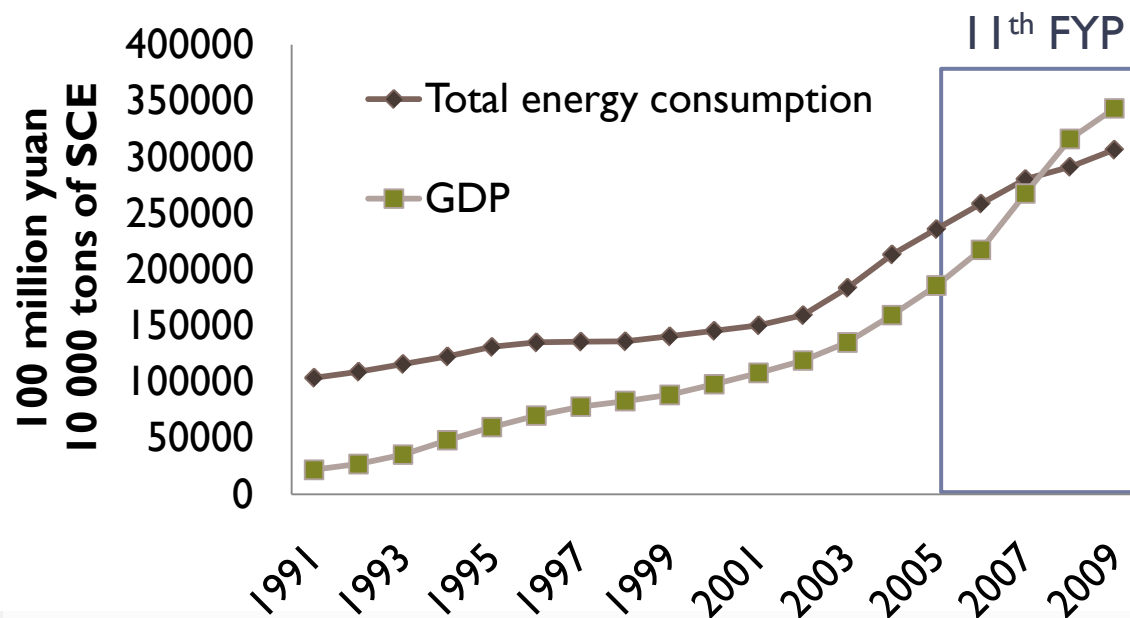
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Target for energy efficiency

▶ 16 % reduction of energy consumption per unit of GDP

▶ Unit: 10 000 tons of SCE/100 million yuan

11th Five-year plan
(2006-2010) : 20%
(realized 19.1 %)



Policy promoting energy conservation

▶ Demand-Side Management (DSM) Implementation Measures

- ▶ Issued on November 4, 2010; in effect on 1 Jan. 2011
- ▶ Purpose: improving energy use efficiency
- ▶ While increasing power supply, DSM measures should be considered and given priority
- ▶ Authorities at different levels in charge of pricing shall improve peak-valley pricing and encourage power storage at valley
- ▶ Users are encouraged to adopt highly efficient power-using equipments and advanced technical measures
 - ▶ frequency converting, heat pump, cool storage, heat storage, etc.



Studies on rebound effects



Chinese Studies on Rebound Effects

Author/year	Data	Method	Rebound effect (%)	Trend
Zhou and Lin (2007)	National wide 1978-2004	Direct measuring Technological effect	30-80 1979-2004: 40.91 (1979-1989: 78.81) (1979-2001: 66.46) (1990-2001: 55.13)	descending
Wang and Zhou (2008)	National wide 1981-2004	Direct measuring Technological effect and Structural effect	1981-2004: 62.8 (1981-1985: 100.9) (1986-1990: 75.6) (1991-1995: 43.4) (1996-2001: 38.7)	descending
Liu and Liu (2008)	Provincial panel 1985-2005	Direct measuring Neoclassical production function	53.68 Significant difference between east, central and west region	descending

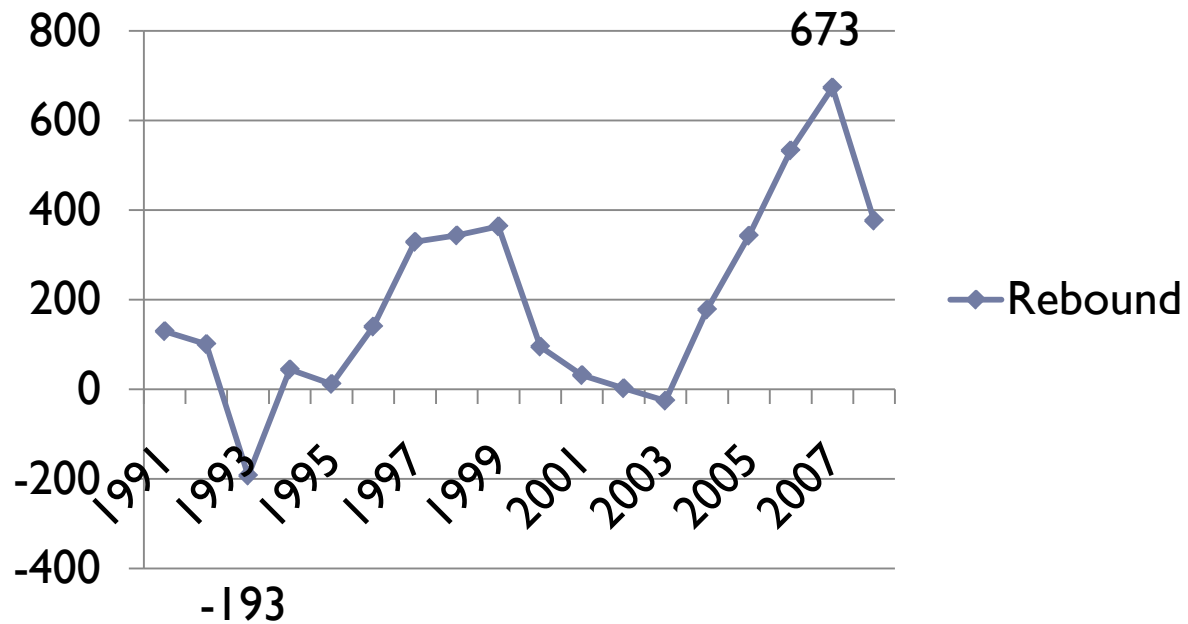


Chinese Studies on Rebound Effects

Author/year	Data	Method	Rebound effect (%)	Trend
Liang et al. (2009)	Social accounting matrix (SAM) base on 2002	CGE	Rebound effect exists, but sectoral specific	N/A
Yang et al. (2010)	Zhejiang Province 1990-2008 (18 years)	Multiple periods model of IPAT function	9 years: backfire effect 2 years: complete rebound effect 5 years: partial rebound effect 2 years: zero rebound effect	fluctuating
Zha and zhou (2010)	SAM based on 2002	CGE	Coal : 32.17 Oil : 33.06 Electricity : 32.28	N/A
Chen (2011)	Hubei Province 1980-2007	Direct measuring	123.7 (1981-1989: 301.6) (1990-1999:56.2) (2000-2007:53.7)	descending



Rebound



Yang et al. (2010)



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Comparison of Chinese studies and others

Chinese studies

- ▶ New research field
- ▶ Macro-level
- ▶ Technological *and institutional/structural change*
- ▶ Pricing system:
 - ▶ Central planning → dual-track pricing
- ▶ Salient regional/sectoral differences

Western studies

- ▶ Developed since the 1970s
- ▶ Many focusing on micro-level
- ▶ Technological improvement



Economic models, social models, and integration

Economic dimensions

- ▶ Validating models
 - ▶ Cross-national comparisons
 - ▶ Data availability & comparability
- ▶ In Chinese context:
 - ▶ Income effects versus regional differences

Social dimensions

- ▶ Consumer preferences and behaviors
 - ▶ Value of time
 - ▶ E.g., favoring faster modes of transportation
 - ▶ Leisure versus saving propensity
 - ▶ Different types of consumers
 - ▶ Government, household, firms...



Single well-defined production system



Discussion & Question



Future research direction

- ▶ Rebound effects are both economic and social phenomenon
 - ▶ Behavioral and systems responses to cost reductions of energy services
- ▶ Measuring the rebound effects versus identifying underlying mechanisms
- ▶ Interaction between macro- and micro-levels



Interactions among multiple policy dimensions

Policy dimensions	Emphasis	Impact on energy consumption
Energy technological improvement	Energy efficiency Non-fossil fuel energy	↓
Change of industrial structure	New energy	↓
Social warfare	Urbanization Improving living standard	↑
Mode of economic growth	Consumption	↑
Energy conservation	Demand side management	↓

